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contains were originally University Extension lectures, the syllabi and bibliography of which are given in an appendix. The book is thus not to be classed with Jebb's standard Introduction to Homer. Only incidental reference is made to such topics as Homeric geography, art, manners, and the Homeric question. The point of view is for the most part the literary and æsthetic. The poems are regarded as works of pure imagination, containing no discoverable transcript of a once existing society, yet, in the large sense, truthful, and portraying with exquisite art lofty types of humanity.

About one-fourth of the book consists of original renderings, mainly in line-for-line hexameter verse, which Mr. Lawton, in a Protean metaphor, asserts to be "a closer *echo* of the Homeric verse than anything else in our rhythmical *armoury*." Pronounced by the translator, these lines were no doubt as musical as they are faithful to the sense of the original, but the reader may have to make several trials at some of them before they will run as hexameters.

While Mr. Lawton has succeeded in his immediate aim, he has at the same time produced a book which teachers of Homer will read with profit, and which, for its graceful discourse on literary themes of perennial charm, should find favor with all lovers of the humanities.

FRANK M. BRONSON

A History of Elementary Mathematics. By FLORIAN CAJORI. New York: The Macmillan Co., 1896. Pp. 304.

SEVERAL attempts have been made within the past few years to set forth, in small compass, the leading facts in the development of elementary mathematics. Hoefer was one of the first in the field, but his *Histoire des Mathématiques*, published some twenty years ago, has never taken a high rank. Ball has recently added to his list a *Primer of the History of Mathematics*, but the work is generally conceded to be unbalanced. Zeuthen's elementary history (in Danish, recently translated into German), relating chiefly to Greek mathematics, is the work of a master, but the want of references and of exactness of detail makes it unsatisfactory. Fink's little *Geschichte der Elementar Mathematik* (Tübingen, 1890) is, perhaps, as satisfactory a work of its kind as has appeared, although it is by no means free from errors, nor is it limited to the elements. The contributions of Tannery, Günther, Loria, Unger, and others, being restricted to special periods or

branches, and Cantor's great treatise, need hardly be mentioned in this connection.

Thus it comes about that Professor Cajori enters a field with few rivals. For this reason, if for no other, his work cannot fail to be received with interest—an interest which is justified as soon as one begins to examine its pages. Claiming to attempt little more than a compilation from the great histories, the author has selected his materials from the best sources, has been cautious in his dependence on unreliable writers like Marie, has shown a wide range of reading, and has, in general, exercised skill in the compilation and arrangement of the work.

Furthermore, the effort is commendable from a pedagogical standpoint. Professor Cajori is an enthusiast for good teaching. He knows the tangled pathway which the science has trod, and he is thoroughly progressive in his desire to make the way more straight in the future. He contends for the teaching of the metric system, for the return to arithmetical analysis from the barbarous methods of compound proportion, for the exponential notation in place of the less scientific radical sign in common use, and for various other much needed reforms. He has no sympathy for the few remaining believers in the "direction" panacea for the difficulty with parallels and in the notion that a circle is a polygon with an infinite number of sides, nor for those who have not yet learned that Napierian logarithms are misnamed, nor for the Englishmen's praise of Euclid's fifth book which they never read in their schools.

For these reasons the work can be recommended as one of the most usable of those devoted to the general development of elementary mathematics. As a class book to be supplemented by lectures it will serve a useful purpose, while its numerous references make it valuable even for advanced students. Moreover, the price is such as to place it within the reach of all, a desideratum which has long been manifest.

Notwithstanding what has been said in favor of the work, it would be wrong to leave the impression that it is above criticism. Even the casual reader cannot fail to be annoyed at the typographical errors, which average one to every ten pages or less. The unscientific transliteration of the oriental names is another source of irritation. The diacritical marks employed by Cantor and Hankel, and fully explained in the latter's *Geschichte der Mathematik*, are sometimes used and sometimes neglected, but they are nowhere explained. What, then, must

be the result if the average reader attempts to pronounce a name like Alkalsâdî (in Cantor, Alkalsâdî)?

Among the specific criticisms which will occur to the reader, the following may be mentioned as prominent types: The statement that "the earliest printed arithmetic appeared in 1482 at Bamberg" refers, of course, to Germany, although this is liable to be misunderstood. But it is in nowise bettered by the assertion that "the earliest printed German arithmetic appeared in the same year as the first printed Italian arithmetic." This statement is translated from Unger, who is generally reliable, but who seems strangely ignorant of the Treviso arithmetic, since that work was discovered more than a quarter of a century before his book appeared. Some mention should also be made of the work on "algorism" by Prosdócimo de' Beldomandi, which appeared at Padua in 1483. That "after the middle of the sixteenth century . . . usury came to be confined to the taking of exorbitant or illegal interest is true in letter but not in spirit; in Elizabeth's statutes, in the King James Bible, and at least as late as the time of Charles I, the word was used as synonymous with interest. The assertion that "little is known of the history of geometry from the time of Apollonius to the beginning of the Christian era" is rather sweeping; for, besides Zenodorus, Hypsicles, Hipparchus, and Heron, who are mentioned by Professor Cajori, there are the familiar names of Nicomedes, Diocles, and Theodosius (of whose *Sphærica* mention is made on p. 133), not to speak of Perseus, who wrote on spirals, and Dionysodorus, whose solution of a celebrated problem of Archimedes is noteworthy.

In the way of brief criticisms the following may be mentioned:

P. 9.—The Babylonian tablet in question dates from the period 1600–2300 B. C., and not from 1600 *or* 2300.

P. 27.—In speaking of the ancient abacus the painting on the Darius vase at Naples deserves mention.

P. 28.—The expression, "about the *time* . . . of Hypsicles . . . and Ptolemæus" is, considered chronologically, like "the *time* of Oliver Cromwell and Grover Cleveland."

P. 31.—Did Nicomachus write a work in *Greek entitled* *Introductio Arithmetica*?

P. 92.—*Quadrivium* appears under the very rare form *quadruvium*. It is rather odd, too, that Cantor (at least in the first edition of his

Vorlesungen) spells it just half the time one way and half the time the other.

P. 105, n. 1.—Was Abelard's manuscript translation of Alchwarizmi *found* by Boncompagni? He seems merely to have edited it.

P. 111.—This made-up Arabic should really be pardoned, because it is the publishers' fault and not the author's, and it is very amusing. If the reader were apt to use it, however, it would be another matter.

Pp. 140, etc.—The translation of "*Rechenmeister*" by "practitioner" is certainly quite misleading.

P. 142, n. 2.—This error in the reference to Boncompagni evidently came from reading only a part of a note in Cantor. The pages mentioned are incorrect.

P. 144.—Following Cantor, a couple of slight errors are made in transcribing Chuquet's old French. In the original we have "ottyllion" and "vouloit." (Boncompagni, XIII, 594.)

P. 149.—Why is casting out 9's "poorly adapted for computation on paper or slate"?

P. 153.—In searching for the origin of the decimal point, mention should certainly be made of the tables of Pitiscus (1612) in which it is used. Peacock could hardly be depended on as an authority in such a matter.

P. 173.—The student would do well to add a reference to Ridgeway's *Origin of Currency and Weight Standards* (Cambridge, 1892), especially on the question of the pennyweight and the apothecaries' table, in which Professor Cajori confesses himself at loss.

P. 228.—As would be inferred from the note, the Cardan solution is taken from Matthiessen. The original symbolism is somewhat more interesting. (*Ars Magna*, folio 30.)

P. 243.—It is to be regretted that no mention is made of Wessel's contribution to the theory of the imaginary, one of the most valuable in the history of the subject.

P. 252.—A wrong impression is given by the statement that Desargues was rescued from oblivion by Brianchon and Poncelet. These are, as stated, Taylor's words. But they should be supplemented by the important paragraph relating to Chasles, who did more than the other two together.

P. 260.—The "Mr. Davies" of p. 189, and the "F. S. Davies" of p. 260, indexed separately, are one and the same T. S. Davies.

In the matter of chronology the only criticism which can be passed

is that the author has not been uniform in his symbol for doubt "(?)." Occasionally he seems, as in the case of "370?" for Pappus, to depart from the best authorities, but this is rare. Among the questionable dates which are given without the interrogation sign, those attached to the following may be mentioned: Thales, Archytas, Plato (347), Leonardo of Pisa (1175), Girard and Ceva.

As to the style in which the work is written opinions are apt to differ considerably. One cannot say that the expressions, like "a leathern document," "pretty proofs," and the German "flowering time" are incorrect; they simply sound odd. So the legal right to coin the word "abacal" must be unquestioned, as also the continued use of expressions of which the following is a type: "Famous is his application of the last theorem." It must be confessed, however, that there are numerous examples of a style which seems somewhat out of place in a serious work of this nature. But, after all, the book is interesting, and that is a great desideratum in such a contribution.

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NOTES

THE Committee on College Entrance Requirements held a preliminary meeting at Indianapolis, on February 17.

THE April number of the *SCHOOL REVIEW* will contain the full report of the February meeting of the North Central Association of Colleges and Preparatory Schools.

THE Harvard summer school and the summer session of the Lawrence Scientific school are announcing their courses in good season. They have done much to give dignity to summer study, and deserve highly of the summer school public. Instruction begins Tuesday, July 6.

ON the anniversary of the centennial of the birth of Mary Lyon, the founder of Mt. Holyoke College, February 28, 1897, the alumnae and friends of that fine institution are endeavoring to raise an endowment fund of \$200,000, to which Dr. D. K. Pearsons, of Chicago, has given conditionally, \$50,000.

WORCESTER ACADEMY sees its way to a new science building which will, it is expected, be ready for occupancy next September. Not only will this building provide room that is greatly needed, but it will also afford facilities for developing a system of advanced science teaching in secondary schools,